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THE FULL UTILIZATION OF PRODUCTION CAPACITY

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At the outset of new difficult tasks, posed by the Five-Year Plan beginning in 1956, the chemical industry must solve a very important problem: it must clarify the question of production capacity. Regulation of this problem, so far quite neglected, should aim first at maintaining the use of the full production capacity of plants already existing.

As it is known, the entire political and economic activity of Poland aims to fulfill the ever-growing material and cultural needs of the populace. The fulfillment of this task is made possible by the quantitative and qualitative growth of the productive force in industry, agriculture, and other branches of the national economy, by investments, and better, fuller utilization of the production capacity of existing capital assets.

Not concerning itself properly with the problem of the full utilization of production capacity, the chemical industry will be unable to participate fully in fulfilling this basic task -- the main aim of a socialist state.

To understand the meaning and importance of the fullest possible utilization of production capacity we should take a closer look at it and get acquainted with the basic ideas in that field. This will enable us to comprehend the necessity of the proper and correct computation of production ability and then the utilization of reserves, which at present are often unknown and undiscovered.

To begin with it should be described how the problem of the fullest possible utilization of production capacity is handled in the capitalist and socialist countries.

In capitalist countries the permanent fullest utilization of production capacity, embracing the country's entire economy, is not possible. This is due to natural conditions, resulting from the social structure of these countries. Among the most prominent of these conditions is the private ownership of producer goods. The owners of producer goods try to obtain maximum profits, that results in an unplanned economy of the country, an economy based on spontaneity. This causes such phenomena as business booms, recessions, overproduction, and unemployment. This is followed by ineffective utilization of production capacity and even waste. In capitalist countries the fullest utilization of production capacity is also hampered by the attitude of the workers toward work and equipment. The worker realizes that the producer goods, being the property of a capitalist, also serve as a means of exploiting the worker, and that an increase in labor productivity and the resulting increase in the utilization of production capacity will soon place him in the ranks of the unemployed.

In socialist countries the problem of utilizing production capacity has an entirely different aspect. The planned character of a socialist economy dictates not only the need but the necessity of the fullest possible utilization of production capacity. The attitude of the workers toward work and producer goods is expressed by a personal interest in the adaption of new technique and a constant improvement in utilization of

production capacity. This interest is explained by the fact that the new technique releases the worker from difficult or harmful jobs; the worker realizes that despite the better utilization of production capacity he is not in danger of becoming unemployed. Quite the contrary: a fuller utilization of production capacity allows for additional production, and by the same token, a better and fuller fulfillment of the material and cultural needs of the worker.

But are the possibilities for the full utilization of production capacity in Poland properly reflected in practice? To this question we must answer in the negative. These possibilities are not utilized and the comprehension of the necessity of their utilization did not yet reach many responsible directors of industry and the other branches of the national economy.

As a result, although production plans are being fulfilled, many enterprises does not fully utilize its production capacity, thus creating in almost every plant hidden and often large production reserves. In many plants, including those of the chemical industry, production capacity is determined on the basis of existing bottlenecks, the established norms of equipment productivity are too low, modern technological means and improved work methods are not utilized.

Under such circumstances the actual amount of existing production capacity remains undetermined, and new tasks assigned to different plants cause demands for new construction investments.

The party and the government stressed many times that the planned investments of different industries did not always consider the possibility of increasing production in existing plants. Now the party and the government categorically order that no new investments be made wherever production can be increased through a better utilization of existing production capacity. Such a point of view is fully justified if one realizes that the phenomenon of the nonutilization of production capacity is very harmful to the national economy. It is harmful mainly for 2 reasons: first because it deprives the national economy of a significant amount of production which can be achieved without any new investments, and second because it leads to premature and often unnecessary investments in that particular phase of industry development, thus causing improper utilization of a part of national income, which consequently has a negative influence on the pace of the realization of the basic law of socialism.

The fight for the full utilization of production capacity is not an easy one and requires a constant effort as well as good organization. The basis for undertaking it must be the regulation of the methodological problems, concerning the evaluation, enumeration, and utilization of existing production capacities. In this article we shall concern ourselves with the principles on which organization of work leading to the fullest utilization of production capacity should be based. In the second part of this article we shall discuss the work undertaken so far in this direction by the chemical industry, and especially the instruction issued by the chemical industry, which regulates and defines precisely the ways and methods of calculating the production capacity.

First of all let us examine the definition of production capacity. We should bear in mind at this point that we must differentiate between the production capacity as such and the basis for its evaluation, especially the norm for the productivity of equipment. It is accepted that production capacity is expressed by the amount of the production of a specific plant, unit, or installation during a unit of time, and we are concerned

only with the maximum amount of production which can be achieved. In other words, production capacity is a technological-economical indicator, expressed in number of products, semifinished products, processed raw materials, or the scope of production work maximally possible to achieve during a given unit of time. In the chemical industry the production capacity is to be understood as the maximum production achieved by a given production unit during one year.

The fact that by production capacity we understand the amount of production achieved during one year and not during some other unit of time (one hour for instance) is important since it enables us to differentiate exactly between production capacity as such and equipment productivity, which is merely one of the factors serving to calculate the production capacity.

However the above definition of production capacity in the chemical industry does not cover the problem completely because the achievement of the greatest possible amount of production actually depends on several technological and economic factors.

To understand the nature of production capacity and the basis for calculating it, an exact description of these factors and establishing to what extent each of them influences the achievement of the fullest possible amount of production is of extreme importance.

The number of factors which influence the size of production capacity is comparatively large. However 4 basic factors of primary importance should be singled out. They are:

(1) the technological norm of productivity of a machinery unit (equipment) per unit of time;

(2) amount of working hours of a given installation during one year;

(3) the kind of installation or a group of installations which are accepted as the basis in calculating the production capacity;

(4) the number of machines (or installations) which is considered in calculating the production capacity.

The other important factors to be considered while calculating the production capacity, and which we shall list as factors of secondary importance, are: leading consumption indicators of raw materials, supplies and energy of all kinds, proper work organization, advanced technology, optimum assortment of production, required quality of production.

As far as the factors of primary importance are concerned, the technological norm of productivity of an equipment unit per unit of time is of decisive significance. This significance is due to the fact that thanks to the development of socialist work competition and the introduction of new advanced work methods, the technological norm for the productivity of an equipment unit per unit of time increases continuously. The proper determination of the upper limit of the equipment productivity norm is decisive in calculating the production capacity.

Only the mobilization norms can be considered as the basis for calculating the production capacity, i.e., such norms which are based on superior technological processes with a simultaneous maintenance of the high quality of production. The experience of the leading shockworkers

should form the basis for determining the mobilizing and correct norms of equipment productivity. STAT

Concretely then it can be stated that the highest technological norms of equipment productivity per unit of time, achieved by the leading shock-workers in separate leading installation units of a given branch of the chemical industry, should be taken as the basis for calculating the production capacity of industrial plants.

The following example will explain the above statement: as an equipment productivity norm let us take the productivity of pyrites combustion per sq m of the pyrites oven shelve during a 24 hour period. Let us assume that during the last quarter the result achieved in the entire industry averaged 200 kg/m^2/24 hours. Let us further assume that the highest productivity norm, achieved by the best shock-workers in leading plants under ideal production conditions reaches 250 kg/m^2/24 hours. This last norm then -- 250 kg/m^2/24 hours -- must be taken as the basis for calculating the production capacity of the oven division (consisting of ovens of the same type) for the entire sulphuric acid industry.

This high productivity norm, i.e., the full production capacity at that moment, can be achieved by the oven division workers of all plants provided that these plants create similar working conditions as in the leading plants and that all the workers adapt the work methods of the best shock-workers who achieved the 250 kg/m^2/24 hours result.

As a rule, achievement of such high productivity norms occurs gradually, through the establishment of moderatively progressing productivity norms, which should be set midway between the average arithmetical indicators (200 in our example) and the indicators achieved by the best shock-workers (250 in our example). Thus the moderatively progressing norm in our example should be set at 225 kg/m^2/24 hours. Such a norm should be established for the next planning phase and it should become the basis for preparing periodic production plans. It is clear that the introduction of the moderatively progressing norms should be preceded by planning such technological-organizational tasks that their fulfillment within the set time-limit will create conditions necessary to achieve this norm.

As a result of a continuous improvement of working conditions and the adaptation of advanced work methods by all the workers of a given unit, there is in the final phase a possibility of not only reaching but even exceeding the production capacity determined on the basis of an actual achievement of the best shock-workers at a given period (250 kg/m^2/24 hours in our example). Of course if proper methodology is used in calculating the production capacity, reaching and exceeding the determined production capacity is not easy and requires an improvement of several technological-economical factors as well as the introduction of new and very productive work methods.

The number of working hours of a production plant during one year is the second successive basic factor which influences the increase of production capacity.

The following work periods are most widely used in the chemical industry:

(a) a 3-shift continuous period throughout the entire year, i.e., 8,760 work-hours;

(b) a 3-shift continuous period throughout the entire year, with the exception of holidays and days off, i.e., 7,320 work-hours;

(c) a 2-shift movement throughout the entire year, with the exception of holidays and days off, i.e., 4,880 work-hours.

Comparing the work-time scope of these 3 variants we can see that much production capacity is not utilized due to a reduced number of work-hours. Should a plant working according to the second variant be switched to the first, its production capacity would increase by some 15%; as a result of a similar switch from the third variant it would increase by some 100%. Thus it is clear how the national economy could receive much additional production without any new investments.

Considering that in the chemical industry several plants successfully employ the continuous work system, it is proper and necessary to calculate the production capacity on the basis of the full calendar period, i.e., 8,760 hours (both for plants working on a full-time and part-time basis). Considering further that the overhauling periods are syatematically being shortened and in some cases do not occur more often than once in several years, in calculating the production capacity the overhauling periods should not be deducted from the original 8,760 hours. Deduction of this amount of time would necessitate an annual correction of the production capacity. Therefore the overhauling periods should be considered not in the production capacity but in the plans for utilization of that capacity. Concretely, then, it can be stated that to calculate the production capacity of plants working on full- and part-time basis, the full calendar period (i.e., 8,760 hours) should be considered, without deducting any periods of equipment overhaul from that amount of time.

Up to now in determining the production capacity the so-called method of equating the production with production bottlenecks was often used, i.e., it was thought that the production capacity of a given plant should be determined on the basis of installations which created bottlenecks in production. To prevent such harmful phenomena it is necessary to determine what kind of equipment or equipment group of a given production kombinat should be considered as the basis for calculating the production capacity. This will exclude other segments of the production kombinat as factors in calculating the production capacity of a given plant, and, provided that some of them will not become production bottlenecks, will not decrease the reproduction capacity of that plant. Apart from determining the production capacity on the basis of the key equipment complex, it is necessary to determine the organizational-technological tasks, fulfillment of which within the specified time limits will assure the removal of exposed production bottlenecks. It is quite clear that both the effort to remove the production bottleneck and to determine the basic equipment or a basic complex of equipment, according to which the production capacity is to be calculated, must be preceded by a thorough economic analysis.

Let us assume for example that we shall calculate the production capacity of a sulfuric acid plant, working with the tower system, on the basis of the oven division.

We assume the production capacity of the ovens to be 100, and that in comparison with it the production capacity of other equipment is as follows: raw material loading equipment -- 130, oven ventilators -- 97, waste removal equipment -- 90, electrofilters -- 125, coolers -- 94, pumps -- 96, towers -- 99.

Assuming on the basis of an analysis that has been conducted that we shall calculate the production capacity according to the oven division, we also accept that all equipment with a production capacity lower than 100 is a bottleneck. Apparently the waste removal equipment is the worst bottleneck. Should we use the bottleneck equation method and should we calculate the production capacity of the entire plant on the basis of the production capacity of the waste removal equipment, then this auxiliary operation would lower by 10% the production capacity of the entire plant. Such procedure would obviously be wrong. It would also be wrong to take, for instance, the production capacity of the raw materials loading equipment as the basis for calculating the production capacity of the plant. Should this be done, again an auxiliary operation would cause the production capacity to be determined on an unreal level. To achieve such production capacity all the plant's basic installations would have to be enlarged and remodeled, and that, economy wise, would be unjustified.

The above indicates that prior to calculating the production capacity it is necessary to choose correctly a basic equipment complex of a given production kombinat, according to which the production capacity shall be determined. This is especially difficult to do when there are several kinds of installations, all playing important roles in the production process and whose importance weighs heavily on the capital assets of the production kombinat. As we stated before, the choice must be decided by a thorough economic analysis which will indicate the group that should be considered as a basic one and where the removal of production bottlenecks will be feasible under conditions that are most justified economy-wise for the given plant.

In conclusion it should be stated that the production capacity of a plant should be calculated on the basis of the key equipment complex (a basic part of equipment) of a given production kombinat with a simultaneous outline of concrete tasks aiming at the removal of production bottlenecks in the remaining segments of equipment. These tasks should be fulfilled within the planned time limits; afterwards the entire production kombinat should achieve the planned production capacity.

It can be observed in several plants that quite often some installations are not considered in calculating the production capacity. For instance this applies to machinery which is freely defined as a reserve, or to installations which are not functioning or are dismounted pending repairs and overhauls. This leads to the fact that in calculating the production capacity these installations are excluded from the production turnover; this results in freezing seizable state assets. To prevent such undesirable phenomena, it must be defined what installations and how many of them can be considered reserve equipment. This must be done for each branch of chemical production, wherever necessary.

These exactly defined installations are not to be considered in calculating the production capacity. All remaining complete installations however, which figure in the inventory of the enterprise and which were installed in production units, should be included in calculating the production capacity.

Therefore regarding the fourth basic factor, which influences the production capacity, we can state that in determining the production capacity all complete, installed machinery, figuring in the inventory of an enterprise, should be included in the basis for the calculations, regardless of whether they are functioning or not, and regardless of whether at that moment they are dismounted and are being repaired or overhauled.

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As first among the factors which we consider secondary and which influence production capacity we mentioned the leading consumption indicators for materials, electric energy, steam, etc, per unit of production. In determining the production capacity only the leading consumption norms should be considered, i.e., norms achieved by the production innovators in the leading plants of a given branch of the industry. Application and acceptance of oversized norms as a basis for calculating the production capacity and thus creating "reserves" in the cost of production plans, is harmful to the interests of the enterprise and to the interests of the state as a whole, because it results in unnecessary losses and raises the production costs, and in many instances causes only partial utilization of production capacity.

Another technological-economical factor very important in calculating the production capacity is organization of work.

In calculating the production capacity, only the best organizational forms and the leading work methods of production innovators must be considered. The proper organization of work influences the effectiveness and size of practically all remaining technological-economical factors. It is impossible to reach high technological-economical indicators in the utilization of equipment, raw materials, supplies, fuel, energy and other material supplies of production without application of superior work organization.

The effectiveness of equipment utilization also depends on the technology used. It is forbidden to base calculations of production capacity on defective or obsolete technology. The production capacity should be calculated on the basis of the most advanced technology possible with the equipment of a given plant. The application of the most superior technological processes results in lowering the consumption norms per unit of production in addition to a fuller utilization of equipment and an increase in production, which follows.

As other important factors influencing the production capacity the assortment of production and the quality of production must be mentioned. To calculate the production capacity, instead of the accidental assortment of production, only the optimum assortment should be considered. This indicates that the production capacity is to be determined not in relation to the planned assortment for a given year, which might prove to be not the optimum assortment at all, but in relation to the optimum assortment.

As regards the quality of production, the basis for calculating the production capacity should be formed by such quality as has been determined by the quality norms for the given product. A lower quality of production may cause only a partial achievement of the planned degree of production capacity utilization, not to mention several other negative results. Thus, for instance, should an artificial fertilizer plant produce fertilizers with a lower fertilizing content than planned by the quality norm, in spite of the fulfillment of production plans agriculture would not receive the large amount of fertilizing substance which the product on the market should contain. This missing amount will equal the production capacity lost and will be caused by the substandard quality of the product.

Considering the above remarks, what should be remembered?

It seems that the following must be borne in mind:

(1) Production capacity is not permanently stable. It changes with improvement of work methods and production technique. But considering the

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basis used in calculating production capacity as indicated above, it can be stabilized. At this moment production capacity does not differ basically from the annual production plan and is easily surpassed as a result of even an unsignificant overfulfillment of the production plan.

(2) The production capacity indicates the greatest production possible under the most favorable conditions. The production capacity should be identical for installations and plants of the same type, regardless of their location and condition.

(3) The actual conditions prevailing in a given plant or a production kombinat are not considered in calculating the production capacity. But they are considered in planning the amount of production capacity utilized, on which the production plan is based. In other words, it can be said that the production capacity indicates how much can be produced by a given installation under the most favorable conditions, while the production plan indicates how much a given installation should produce under actually existing conditions. When the problem is treated thus it becomes quite apparent that the production capacity shows a way to master the technology in a perspective. The degree of production capacity planned for utilization, and consequently the production plan, indicates the fullest feasible utilization of the production capacity during a given planned period. The degree of production capacity utilized, while defining the actual production ability, does not only constitute the base for determining the production plans for a given planned period, but also becomes a base for drawing up an organizational-technological tasks plan, aiming to master the production capacity either partially or completely during a given period.

(4) The difference between the actual production capacity and the degree it is utilized forms a production reserve, and the ratio of the degree of production capacity utilized to the amount of production capacity is known as the coefficient of production capacity utilization. This coefficient is expressed as a percentage.

(5) Established production capacities should be revised occasionally, e.g., every year. Due to the constant progress of technology and the almost daily achievements of rationalizors and shock-workers, this must be done to avoid a situation in which a plant would produce more than its production capacity would allow. Such a phenomenon proves that the previously determined production capacity is now obsolete and does not correspond to the actual situation in the plant.

If the method of evaluating and calculating production capacity is based on the foundations discussed above, it will be possible to avoid errors, committed up to now in calculating production capacity, and it will undoubtedly help to disclose the true extent of the hidden production reserves.

Any work that will be undertaken to achieve this great task will strengthen the position of the chemical industry as the second major industry of the Polish Peoples Republic and will contribute to its increased participation in the nationwide socialistic Polish economy. Such undertakings were already initiated by the chemical industry; they shall be discussed in the second part of this article.

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